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Short Report

Spinalis capitis, or an accessory paraspinous muscle?

ALEXANDER MARTIN

Department of Anatomy, Health Sciences Centre, University of Western Ontario, London, Ontario, Canada

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ABSTRACT

A unilateral muscle, the location and dimensions of which do not exactly conform to existing descriptions, was found during dissection of the suboccipital region. The muscle in question extended from the spine and transverse process of the 6th cervical vertebra to the base of the skull. At its rostral attachment it blended with the insertion of the left rectus capitis posterior minor muscle on the inferior nuchal line. The caudal attachment arched over the semispinalis cervicis, separated from that muscle by an extensive venous complex. Medially, along the length of the muscle, weak fascial attachments to the ligamentum nuchae were present. Arterial branches from the occipital artery entered the muscle near its rostral end and nerve fibres and vascular channels from the lower cervical region entered the deep surface of the muscle.

Key words: Skeletal muscle; skull; cervical spine.

INTRODUCTION

In the majority of modern textbooks of anatomy, as well as in the recent one on the adult spinal cord (Frymoyer, 1991), the so-called paraspinous muscles of the posterior neck are routinely described and illustrated with virtually no reference to abnormalities or anomalies. On exception is the semispinalis capitis, a member of the transversospinal group, whose fibres in general pass in a superomedial direction from transverse to spinous processes. The medial portion of this muscle, often more or less distinct and usually shown as passing vertically, is generally considered to be the spinalis capitis (Romanes 1981; Hollinshead & Rosse 1985; Woodburne & Burkel 1988; Williams et al. 1989). When described separately, the caudal attachments of the spinalis capitis are usually listed as the spines of the 7th cervical and 1st thoracic vertebrae as well as the broader attachment of this muscle to the transverse and articular processes of the upper thoracic and lower cervical vertebrae.

Even in the older classic textbooks of anatomy such as Testut (1899), Toldt (1919), Sobotta (1926), Morris (1953), Spalteholz (1953) and Bargmann et al. (1968), the only clear reference and illustration of the spinalis capitis was found in Sobotta (1926). In Spalteholz (1953) and Bargmann et al. (1968), however, the medial fibres of the semispinalis capitis, while not labelled as a separate entity, can be followed caudally to attachments on upper thoracic and lower cervical spinous processes. These medial fibres, while not labelled as such, would appear to represent the portion of the semispinalis generally considered to be the spinalis capitis muscle.

A clear illustration of the spinal attachments of the spinalis capitis muscle has been found in only one of the modern atlases of anatomy (Clemente, 1987). This is not surprising since Clemente derived his atlas principally from the Sobotta collection. In this atlas, the spinalis is shown to have a single attachment to the spine of the 7th cervical vertebra (fig. 526).

MATERIALS AND METHODS

During dissection of the suboccipital region of a 65-y-old male cadaver, a unilateral muscle was found whose morphology and attachments did not appear exactly to match any of the existing descriptions. The muscle in question was a distinct entity, separated both from the overlying semispinalis capitis and the

Correspondence to Dr Alexander Martin, Department of Anatomy, Health Sciences Centre, University of Western Ontario, London, Ontario, Canada N6A 5C1.

Figs 1–3. Dorsal and dorsolateral views of the cervical dissection. The preliminary dissection is shown in Figure 1. Deeper dissections illustrating the spines and transverse processes of C3–7 are presented in Figures 2 and 3. In Figure 2, the probe tip is in the bifid spine of the 6th cervical vertebra.

suboccipital muscles. To illustrate the relationships in the region, the semispinalis cervicis as well as all short rotators on the right side of the neck, as far caudal as the 7th cervical vertebra, were removed.

FINDINGS

The muscle in question, seen on reflection of the left semispinalis capitis, was unilateral, extending from the base of the skull of the 6th cervical vertebra (Figs 1, 2). At its rostral attachment the muscle blended with the left rectus capitis posterior minor and was ~ 1 cm in width. The muscle lay superficial to the suboccipital muscles and ran parallel to and in close proximity to the ligamentum nuchae to which it had numerous weak fascial attachments. At the lower border of the 2nd cervical vertebra, the muscle bifurcated and arched over the semispinalis cervicis. The muscle extended caudally, superficial to the semispinalis cervicis, separated from that muscle by a fascial plane and an extensive venous network, branches of which perforated the diverging arms of the muscle (Fig. 2). Medially it attached to the left portion of the bifid spine of the 6th cervical vertebra (Fig. 2), and continued to join the ligamentum nuchae. Laterally, a thin attachment joined the transverse process of the 6th cervical vertebra as well as the fascia over the semispinalis cervicis. At its widest part the muscle measured 2 cm. The nerve and vascular supply were primarily from dorsal branches of lower cervical nerves (2–6) and deep cervical arteries. At or near the rostral attachment, branches of the occipital artery appeared also to supply the muscle.

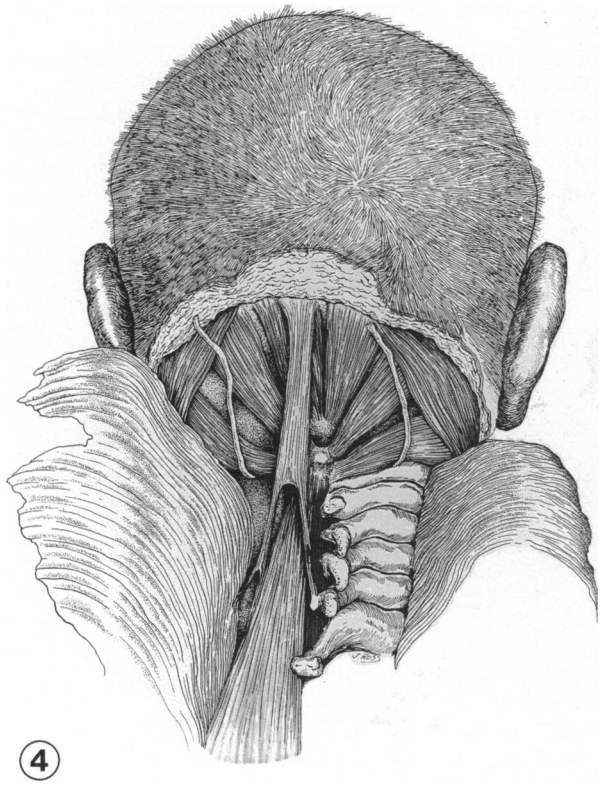

Fig. 4. Drawing of spinalis capitis and the surrounding muscles.

In addition to the unilateral muscle there was mild pathology in the posterior neck region. The spines of cervical vertebrae 3–6 were displaced, lying approximately 1 cm to the right of the midline. This displacement of the spines was most noticeable following excision of the muscles on the right side of the neck, all of which appeared to be of normal size and direction (Figs 3–4).

DISCUSSION

While the spinalis capitis is listed as a separate entity in the current Nomina Anatomica (1989), examination of many existing texts and atlases of anatomy, including Hollinshead (1969), has failed to reveal any clear and unequivocal description or demarcation of this muscle. From such reviews, however, and the present dissection, it may be postulated that the muscle found during our dissection is indeed a morphologically separate spinalis capitis. Its attachment to the spine of C6, and its rostral insertion into the base of the skull, between the semispinalis capitis and the rectus capitis posterior minor, suggest that it is more than just a mere slip of the semispinalis. The lack of information on a morphologically separate spinalis capitis, may be due to the commonly stated description that 'the spinalis capitis is rarely a separate muscle, but is instead a medial part of the semispinalis capitis'. Such a view is strengthened when dissection of the suboccipital region is required. Instructions in 3 commonly used dissection guides simply say 'reflect the semispinalis capitis'. Mention is rarely made of the possibility of a separate spinalis capitis, and none of the listed dissection guides seeks to identify such a muscle (Aitken et al. 1976; Romanes, 1986; Sauerland, 1991).

Based upon our findings that the muscle lies, in its entirety, deep to semispinalis capitis, it is difficult to believe that the muscle in question is simply a deeper part of semispinalis. In addition, a muscle located in the nuchal region, extending rostrally from the attachment of semispinalis and spinalis cervicis to the occiput, was described in Quain's Anatomy (Schafer & Thane, 1894). However, this example was simply listed as an accessory slip of the suboccipital muscles and was not named separately.

With regard to the unilateral nature of the muscle, development factors may be implicated. The dorsal

spinal musculature as well as the vertebrae arise from common mesodermal tissue, the somites. As development proceeds, the myotome portion of the somite, (destined to form muscle) separates from the sclerotome portion (destined to form bone). The muscle masses split and fuse, eventually giving rise to the layers present in the adult (Arey, 1965; Sadler, 1990). It can only be speculated that, instead of separating normally, the portion of the myotome destined to form the right spinalis remained fused with the precursor of the overlying semispinalis. That such an event occurs should not be surprising; it might have been anticipated that similar events would occur more often. This is especially true when we perceive the complexity and interrelationships, both morphological and functional, of the deep back muscles.

Mild pathology of the cervical vertebrae was present, as evidenced by the displacement of the spines of C3–6 from the midline. It is unlikely, however, that the presence, location or possible functional effect of the unilateral muscle was a causative factor in such pathology. From its location and fibre direction, its major function would appear to be as an accessory extensor of the head and neck. Because of its unilateral location, and its attachment to the transverse process of C6, some lateral bending of the head to the same side is a possibility. It would be difficult, however, to explain how such a small muscle, without any attachments to cervical vertebrae 3–5, could result in the rotation noted. Medical records were checked with the physician who had treated the patient for approximately 20 y. While the rotation of the vertebrae appeared to be of long duration, neither medical nor radiographic evidence was found to indicate complaints or problems associated with the posterior neck at any time.

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